CLAIM AMENDMENTS

Claim Amendment Summary

Claims pending

- Before this Amendment: Claims 1-42.
- After this Amendment: Claims 1-8, 16-19, 22-26, and 35-39.

Non-Elected, Canceled, or Withdrawn claims: Claims 9-15, 20-21, 27-34, and 40-42.

Amended claims: Claims 1, 16, 22, and 35.

New claims: None.



Claims:

1. (Currently Amended) A method of generating a high-resolution image

from a generic low-resolution image, the method comprising:

extracting a plurality of low-frequency primitives from a low-

resolution image; [and]

replacing one or more respective ones of the plurality of low-

frequency primitives with corresponding primitives from stored training

data to provide a high-frequency primitive layer of the low-resolution

image

interpolating the low-resolution image to provide a low-frequency

image prior to the extracting;

combining the high-frequency primitive layer with the low-frequency

image to provide an intermediate image; and

reconstructing the intermediate image by applying backprojection to

provide a high-resolution image, wherein the backprojection is provided as

follows:

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and

output images at times t and t+1; h is a blurring operator determined by

the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling

operator by a factor s, and \sqrt{s} is a down-sampling operator by a factor s.

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- **2. (Original)** A method as recited in claim 1, wherein the high-frequency primitive layer comprises a plurality of high-frequency primitives.
- **3. (Original)** A method as recited in claim 1, wherein the stored training data comprises a plurality of primal sketch priors.
- **4. (Original)** A method as recited in claim 1, wherein the stored training data is provided by comparing pairs of low-resolution and high-resolution versions of a same training image.
- **5. (Original)** A method as recited in claim 1, further comprising normalizing the plurality of low-frequency primitives prior to the replacing.
- **6. (Original)** A method as recited in claim 1, further comprising applying Markov chain inference to the high-frequency primitive layer to provide contour smoothness.
- **7. (Original)** A method as recited in claim 1, further comprising interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

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8. (**Original**) A method as recited in claim 1, further comprising bicubically interpolating the low-resolution image to provide a low-frequency image prior to the extracting.

9. (Canceled)

10. (Canceled)

11. (Canceled)

12. (Canceled)

13. (Canceled)

14. (Canceled)

15. (Canceled)

16. (Currently Amended) A method comprising:

hallucinating a low-frequency image (I'_{H}) ;

extracting a high-frequency primitive layer ($I_H^{p^*}$) of the hallucinated low-frequency image;

combining the low-frequency image (I'_H) and the high-frequency primitive layer (I^p_H) to provide an intermediate image (I^g_H) ; [and]



reconstructing the intermediate image (I_H^s) to provide a high-resolution image (I_H) , wherein the reconstructing applies backprojection to the intermediate image (I_H^s) to provide the high-resolution image (I_H) , wherein the backprojection is provided as follows:

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and t+1; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s, and $\downarrow s$ is a down-sampling operator by a factor s.

- **17. (Original)** A method as recited in claim 16, further comprising interpolating a low resolution image (I_L) to provide the low-frequency image (I_H) .
- **18. (Original)** A method as recited in claim 16, further comprising bicubically interpolating the low resolution image (I_L) to provide the low-frequency image (I_H) .
- **19. (Original)** A method as recited in claim 16, wherein the high-frequency primitive layer $(I_H^{p^*})$ is provided as follows:

$$I_H^{p^*} = \arg\max p(I_H^p | I_H^l) = \arg\max p(I_H^l | I_H^p) p(I_H^p)$$
.

20. (Canceled)

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21. (Canceled)

22. (Currently Amended) One or more computer-readable media having instructions stored thereon that, when executed, direct a machine to perform acts comprising:

extracting a plurality of low-frequency primitives from a low-resolution image; [and]

replacing one or more respective ones of the plurality of low-frequency primitives with corresponding primitives from stored training data to provide a high-frequency primitive layer of the low-resolution image

interpolating the low-resolution image to provide a low-frequency image prior to the extracting;

combining the high-frequency primitive layer with the low-frequency image to provide an intermediate image; and

reconstructing the intermediate image by applying backprojection to provide a high-resolution image, wherein the backprojection is provided as follows:

$$I_H^{t+1} = I_H^t + (((I_H^t * h) \downarrow s - I_L) \uparrow s) * p$$

where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and t+1; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s, and $\downarrow s$ is a down-sampling operator by a factor s.



- **23. (Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise normalizing the plurality of low-frequency primitives prior to the replacing.
- **24. (Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise applying Markov chain inference to the high-frequency primitive layer to provide contour smoothness.
- **25. (Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise interpolating the low-resolution image to provide a low-frequency image prior to the extracting.
- **26. (Original)** A computer-readable media as recited in claim 22, wherein the acts further comprise bicubically interpolating the low-resolution image to provide a low-frequency image prior to the extracting.
- 27. (Canceled)
- 28. (Canceled)
- 29. (Canceled)
- 30. (Canceled)



- 31. (Canceled)
- 32. (Canceled)
- 33. (Canceled)
- 34. (Canceled)

35. (Currently Amended) An apparatus comprising:

means for extracting a plurality of low-frequency primitives from a low-resolution image; and

means for replacing one or more respective ones of the plurality of low-frequency primitives with corresponding primitives from stored training data for providing a high-frequency primitive layer of the low-resolution image

means for interpolating the low-resolution image to provide a lowfrequency image prior to the extracting;

means for combining the high-frequency primitive layer with the low-frequency image to provide an intermediate image; and

means for reconstructing the intermediate image by applying backprojection to provide a high-resolution image, wherein the backprojection is provided as follows:

$$I_{H}^{t+1} = I_{H}^{t} + (((I_{H}^{t} * h) \downarrow s - I_{L}) \uparrow s) * p$$



where p is a backprojection filter; I_H^t and I_H^{t+1} are input image and output images at times t and t+1; h is a blurring operator determined by the point spread function of the imaging sensor; $\uparrow s$ is an up-sampling operator by a factor s, and $\downarrow s$ is a down-sampling operator by a factor s.

- **36. (Original)** An apparatus as recited in claim 35, further comprising means for normalizing the plurality of low-frequency primitives prior to the replacing.
- **37. (Original)** An apparatus as recited in claim 35, further comprising means for applying Markov chain inference to the high-frequency primitive layer to provide contour smoothness.
- **38. (Original)** An apparatus as recited in claim 35, further comprising means for interpolating the low-resolution image to provide a low-frequency image prior to the extracting.
- **39. (Original)** An apparatus as recited in claim 35, further comprising means for bicubically interpolating the low-resolution image to provide a low-frequency image prior to the extracting.
- 40. (Canceled)

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- (Canceled) 41.
- (Canceled) 42.

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